CLAIMS

We claim:

1. An economical process for recovery of low-sodium salt, preparing free flowing low-sodium salt or optionally preparing iodized low sodium salt and with enhanced recovery of low sodium salt from bittern, the said process comprising steps of:

a) treating the bittern with calcium chloride solution to produce insoluble calcium sulfate,

b) separating calcium sulfate of step (a) to obtain desulphated bittern,

c) evaporating the desulphated bittern of step (b) in solar pans with deposition of excess salt in pans,

d) removing the excess salt deposit of step (c) to obtain concentrated desulphated bittern,

e) feeding the concentrated desulphated bittern of step (d) to a carnallite pans and continuing the solar evaporation till solid deposition is initiated,

f) separating the solid mixture of step (e) constituting a mixture of sodium chloride and carnallite (KCl.MgCl2.6H2O) from end bittern,

g) treating with stirring the solid mixture of step (f) with water over a period of 20-60 minutes to produce desired sodium salt composition and a liquid in equilibrium with this solid containing mainly magnesium chloride with dissolved sodium chloride and potassium chloride,

h) separating the solid product of step (g) from the liquid by centrifugation, and

i) drying the solid of step (h) at a temperature ranging from 90°-130°C to obtain low sodium salt.

2. The process as claimed in claim 1, wherein treating the low-sodium salt of step (i) with an additive to obtain free flowing low sodium salt.

3. The process as claimed in claim 1, wherein treating low-sodium of step (i) with an alkali iodate salt to obtain iodized low sodium salt.

4. The process as claimed in claim 1, wherein recovery of low-sodium salt can be enhanced by recycling the bittern of step (h).

5. A process as claimed in claim 1, wherein the low sodium salt can be produced directly from 29-30°Be' bittern containing sodium chloride, potassium chloride and $Mg2+$.

6. A process as claimed in claim 1, wherein the source for bittern can be from seawater or sub soil origin and preferably bittern having low sulphate content.

7. A process as claimed in claim 1, wherein in step (a) the concentration of calcium chloride solution used is in the range of 80-450 g/liter.

8. A process as claimed in claim 1 wherein in step (a) the source of calcium chloride is from distiller by product waste of soda ash industry.

9. A process as claimed in claim 1, wherein in step (b) the desulphated bittern has a concentration of sodium chloride 90-135 g/liter and potassium chloride 20-25 g/liter.

10. A process as claimed in claim 1, wherein in step (c) the evaporation of desulphated bittern in solar pans is performed to obtain concentrated desulphated bittern of density ranging from 30-33°Be'.

11. A process as claimed in claim 1, wherein in step (c) the potassium chloride and sodium chloride can be adjusted in the range of 20% KCl to 70% KCl by varying between 30 to 33°Be' the density of desulphated bittern.

12. A process as claimed in claim 1, wherein in step (e) the evaporation of concentrated desulphated bittern is performed to achieve a density of 35.5°Be'.

13. A process as claimed in claim 1, wherein in step (g) the ratio of water to the solid mixture ranges from 0.30-0.50 to 1.00.

14. A process as claimed in claim 1, wherein in steps (a to h) are carried out at an ambient temperature and step (i) is carried out at a temperature range of 90°- 130°C.

15. A process as claimed in claim 1, wherein in step (j) the additive used is light magnesium carbonate at a concentration range of 0.01 - 0.05% w/w with respect to low-sodium salt.

16. A process as claimed in claim 1, wherein in step (k) the alkali salt used is potassium iodate at a concentration range of 10-50 ppm with respect to low sodium salt.

17. A process as claimed in claim 1, wherein in step (l) the supernatant liquor of step (h) remaining after decomposing of crude carnallite of step (f) can be recycled in carnallite pan to increase yield of the process to 87-90% based on potassium content of the bittern used.

18. A process as claimed in claim 1, wherein each nutrient calcium and magnesium ranging in the amount 0.01 to 2.0% is drawn from the bittern used and not to be externally added.

19. A process as claimed in claim 1, wherein the isolated yield of low sodium salt from bittern is in the range of 0.03 kg/litre to 0.07 kg/litre.

20. A process as claimed in claim 1, wherein the isolated yield of low sodium salt from bittern after adopting recycling process is in the range of .04 kg/lt to 0.09 kg/lt.

Table 1

ESTIMATED COST OF PRODUCTION FOR 3000 TONS/ANNUM LOW SODIUM SALT BY CONVENTIONAL PROCESS OF MIXING NaCl and KCl (55% NaCl; 45 % KCL)

Raw Material	**Quantity Required/ton**	**Rate in Indian Rupees/ton**	**Annual cost in Rupees/M**
Sodium Chloride	1650	1,000	1.65
Potassium Chloride (Food grade)	1350	20,000	27.00
<u>**Other costs:**</u>			
(including cost of mixing, depreciation on machinery, etc.)		1,000	3.00
Total cost for 3000 tons			31.65
Cost of production per ton			Rs.10,550

Table 2

ESTIMATED COST OF PRODUCTION FOR 3000 TONS/ANNUM LOW SODIUM SALT (55 % NaCl; 45 % KCL) FROM SUB-SOIL AND SEA BITTERNS UNDER INDIAN CONDITIONS

Raw Material	**Quantity Required**	**Rate**	**Cost in Rs./M**
Bittern	80,000 M^3	-	2.4
Calcium chloride	2400 tons (sub-soil bittern)	3500/ton	8.40
(on $CaCl_2.2H_2O$ basis)	6000 tons (sea bittern)	"	21.00
Utilities			
Power	3,55,200 KWH	@ Rs. 4/- KWH	1.42
LDO for drying	12,223 L	@ Rs.18/L	0.22
Water	8,000 m^3	@ Rs.20/m^3	0.16
Field Labour	5,500 man days	@ Rs. 75/ man day	0.42
Supervisory Staff			0.30
Other costs			
Depreciation on plant and machinery (without liner)			0.35
Repair/replacement cost of liner for carnallite pan (assuming the life of liner to be 2 years)			0.75
Interest on capital investment		@ 12% per annum	0.66
Total cost (Rs/M)			
(Sub-soil bittern)			15.08
(Sea bittern)			27.68
Cost of Low Sodium Salt per ton			(in Rupees)
From Sub-soil bittern			5027
From Sea bittern			9227